UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/661,465	09/11/2003	Franco Vitaliano	VXM-001A	7139

7590 05/31/2006	**EXAMINER**
Franco Vitaliano	NEGIN, RUSSELL SCOTT
#2105	

Franco Vitaliano
#2105
4 Longfelow Place
Boston, MA 02114-2818

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1631	

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

		Application No.	Applicant(s)
Office Action Summary		10/661,465	VITALIANO ET AL.
		Examiner	Art Unit
		Russell S. Negin	1631

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 April 2006*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30,34-38,42,45 and 47-65* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30,34-38,42,45 and 47-65* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date *7/21/04*.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Comments

The cancellation of claims 31-33, 39-41, 43, 44, and 46 are acknowledged.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of
matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the
conditions and requirements of this title.

Claims 1-16, 19-30, 36, 37, 42, 45, 47-49, 51-60, 61-63, and 65 are rejected

under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject

matter.

Claims 1-16, 19-30, 36, 37, 42, 45, 47-49, 51-60, 61-63, and 65, as written, do

not sufficiently distinguish over molecules which act as quantum information processing

elements as they exist naturally because the claims do not particularly point out any

non-naturally occurring differences between the claimed products and the naturally

occurring products. In the absence of the hand of man, the naturally occurring products

are considered non-statutory subject matter. *See Diamond v. Chakrabarty*, 447 U.S.

303, 206 USPQ 193 (1980). The claims should be amended to indicate the hand of the

inventor, e.g., by insertion of "Isolated" or "Purified" as taught in the specification on

page 3. See MPEP 2105.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-16, 19-30, 36-37, 42, 45, 47-49, 51-57, and 61-65 are rejected under 35

U.S.C. 102(b) as being anticipated by Gelderblom [AIDS, 1991, volume 5, pages 617-

637].

Claims 1-16, 19-30, 36-37, 42, 45, 47-49, 51-57, and 61-65 state:

1. A quantum information processing element comprising a cage defining a cavity formed from a plurality of self-assembling protein molecules, and one or more cargo elements located within the cavity, wherein at least one of the cargo elements comprises a qubit programmable into a plurality of logical states.

2. A quantum information processing element according to claim 1, comprising receptors for capturing and positioning one or more cargo elements within the cavity.

3. A quantum information processing element according to claim 2, comprising a vesicle located within the cage and enclosing one or more cargo elements, wherein the receptors extend through the vesicle to capture and position a cargo element within the vesicle.

4. A quantum information processing element according to claim 3, comprising adaptors disposed between the receptors and the cage and binding to the receptors.

5. A quantum information processing element according to claim 1, comprising a vesicle located within the cage and enclosing the one or more cargo elements.

6. A quantum information processing element according to claim 1, comprising molecular tethers for capturing and positioning one or more cargo elements within and or outside the cavity.

7. A quantum information processing element according to claim 1, comprising direct cage bonding for capturing and positioning one or more cargo elements within and or outside the cavity.

8. A quantum information processing element according to claim 1, comprising receptors, molecular tethers and direct cage bonding for capturing and positioning one or more cargo elements within and or outside the cavity.

9. A quantum information processing element according to claim 1, comprising one or more cargo elements forming a non-permeable cavity.

10. A quantum information processing element according to claim 3, comprising a vesicle forming a non-permeable cavity.

11. A quantum information processing element according to claim 1, comprising a self-assembling cage that is electrically neutral and inhibits charge transfer between the cage and its enclosed cargo elements.

12. A quantum information processing element according to claim 1, comprising a self-assembling cage that reduces the tendency of a plurality of logical states in a coherent state to collapse into a decoherent state.

13. A quantum information processing element according to claim 1, comprising a non-qubit-only cage that inhibits non-quantum information processing cargo elements from interfering with qubit cargo element operation in other cages.

14. A quantum information processing element according to claim 3, comprising a self-assembling vesicle that is electrically neutral and inhibits charge transfer between the vesicle and its enclosed cargo elements.

15. A quantum information processing element according to claim 3, comprising a self-assembling insulative vesicle that reduces the tendency of a plurality of logical states in a coherent state to collapse into a decoherent state.

16. A quantum information processing element according to claim 4, comprising self-assembling receptors and adaptors that are electrically neutral and inhibit charge transfer between the vesicle and cage and their enclosed cargo elements.

19. A quantum information processing element according to claim 1, comprising a self-assembling framework of cages to structurally support one or more self-assembling QIP elements.

20. A quantum information processing element according to claim 1, comprising a self-assembling electrically neutral substrate of cages to structurally support one or more self-assembling QIP elements.

21. A quantum information processing element according to claim 1, comprising a self-

assembling framework of cages to structurally order one or more self-aligning QIP elements.

22. A quantum information processing element according to claim 1, wherein a cage is empty and includes no cargo elements.

23. A quantum information processing element according to claim 1, wherein the one or more cargo elements is a single cargo element comprising a qubit programmable into a plurality of logical states.

24. A quantum information processing element according to claim 1, wherein the one or more cargo elements are a plurality of cargo elements.

25. A quantum information processing element according to claim 24, wherein the plurality of cargo elements are qubits programmable into a plurality of logical states.

26. A quantum information processing element according to claim 24, wherein at least some of the plurality of cargo elements are quantum information processing cargo elements

27. A quantum information processing element according to claim 24, wherein at least some of the plurality of cargo elements are non-quantum information processing cargo elements.

28. A quantum information processing element according to claim 1, wherein the cargo elements respond to stimuli internal and or external to the cage.

29. A quantum information processing element according to claim 3, wherein a vesicle and its contained cargo elements respond to stimuli internal and or external to the vesicle.

30. A quantum information processing element according to claim 24, wherein a subset of the non-quantum information processing cargo elements include one or more single task and or multitask in vivo and or in vitro agents.

36. A quantum information processing element according to claim 24, wherein a subset of the cargo elements include one or more liquids without dopants or with one or more dopants of any suitable type.

37. A quantum information processing element according to claim 24, wherein a subset of the cargo elements include a gas or vapor without dopants or with one or more dopants of any suitable type.

42. A quantum information processing element according to claim 1, wherein the qubit and the plurality of logical states of the qubit are defined by one or more properties or attributes.

45. A quantum information processing element according to claim 1, wherein the qubit includes one or more species of molecules.

47. A quantum information processing element according to claim 1, wherein the qubit is photon-based and the plurality of logical states of the photon-based qubit include a coherent logical state.

48. A quantum information processing element according to claim 1, wherein the plurality of logical states includes a coherent state.

49. A quantum information processing element according to claim 1, wherein the plurality of logical states includes a coherent state at room temperature.

51. A quantum information processing element according to claim 1, wherein the cage comprises self-assembling synthetic protein molecules.

52. A quantum information processing element according to claim 4, wherein receptors, adaptors, and vesicle comprise natural and or synthetic protein molecules.

53. A quantum information processing element according to claim 1, comprising a coating of one or more materials on part or the entirety of the cage.

54. A quantum information processing element according to claim 4, comprising a coating of one or more materials on a portion or an entirety of the receptors, adaptors, and vesicle.

55. A quantum information processing element according to claim 1, wherein the cage is substantially greater than one nanometer in diameter.

56. A quantum information processing element according to claim 1, wherein the cage is at least about 50 nanometers in diameter.

57. A quantum information processing element according to claim 1, wherein the cage is at least about 100 nanometers in diameter.

61. A quantum information processing element according to claim 1, wherein multiple quantum information processing elements are physically linked together.

62. A quantum information processing element according to claim 1, wherein multiple self-assembling QIP elements are functionally linked together, locally and or at a

distance.

63. A quantum information processing element according to claim 1, wherein the quantum information processing element forms a hybrid system upon its physical and or functional integration with non-invention elements in vitro and or in vivo.

64. A method for forming a quantum information processing element comprising forming from self-assembling protein molecules a cage defining a cavity, and locating one or more cargo elements within the cavity, wherein at least one of the cargo elements comprises a qubit programmable into a plurality of logical states.

65. A quantum information processing element according to claim 1, wherein the quantum information processing element comprises,
        a functionalized cage for attaching one or more elements external to the cage.

The element and method mapped out in the base claims of the instant

application (claims 1 and 64), describe a human immunodeficiency virus (HIV). Figure

3 on page 620 of Gelderblom diagrams the HIV-1 virus. The HIV-1 virus is a cage of

self-assembling proteins (i.e. Figure 2 on page 619) defining a cavity, wherein at least

one of the cargo elements comprises a qubit programmable into a plurality of logical

states. Since a virus holds nucleic acids, and each atom and/or molecule of nucleic

acid can be considered a qubit based on its electron spin (i.e. every molecule, no matter

how large has a wave function), HIV-1 Virus fits the description of the QIP element

stated in the base claim.

        It is evident from Figure 3 of Gelderblom that the schematic has receptors useful

for positioning the contents of the virus. The interior of the virus forms a vesicle through

which the receptors extend. "Adaptors" also exist in the diagram. This vesicle is

located within the protein "cage" and encloses one or more cargo elements. The

receptors are interpreted to act as tethers for capturing and infecting biological objects

outside the virus. In addition, the contents of the virus have the capability of directly

bonding to the interior of the protein cage. The QIP element as shown in Figure 3 is non-permeable and has a non-permeable vesicle to shield outside molecules. The QIP element (or in this case virus) is electrostatically neutral at a single value of pH; when solution conditions are adjusted to this value of pH, charge transfer is inhibited. As illustrated in Figure 2, the HIV-1 virus is self-assembling- at the isoelectric pH, charge transfer between viruses, receptors, and adaptors is inhibited.

In the case of an empty virus (no cargo elements), the cage comprises a non-qubit only cage. Viruses together as shown in Figure 2 of Gelderblom comprise a self-assembling framework of cages to structurally support one or more self assembling QIP elements. At the isoelectric pH, these frameworks of cages are electrostatically neutral. The framework of cages can align the structural elements within each virus.

Viruses respond to stimuli external to the virus itself (i.e. the method in which HIV is spread). The nucleic acids inside the virus are considered multitask in vitro agents. It is inherent that an atom on at least one molecule of the nucleic acid has an unpaired electron used to define the qubit by electron spin polarization. The nucleic acid is also a plurality of QIP elements physically linked together. The virus encloses a plurality of different molecules and is self-assembled. In vivo viruses are in aqueous solution, so they are enclosed and coated with water molecules. Figure 1 of Gelderblom illustrates that HIV-1 viruses are greater than 100 nanometers in diameter.

It is inherent, that when investigated on an atomic level, the nucleic acids atoms form coherent states that collapse into a decoherent state in the classical limit of the entire virus.

Claims 1-16, 19-30, 36-37, 42, 45, 47-49, 51-60, and 61-65 are rejected under 35

U.S.C. 102(b) as being anticipated by Stewart et al. [Current Topics is Microbiology and

Immunology, 1995, volume 199, pages 25-38].

Claims 1-16, 19-30, 36-37, 42, 45, 47-49, 51-60, and 61-65 state:

1. A quantum information processing element comprising a cage defining a cavity
formed from a plurality of self-assembling protein molecules, and one or more cargo
elements located within the cavity, wherein at least one of the cargo elements
comprises a qubit programmable into a plurality of logical states.

2. A quantum information processing element according to claim 1, comprising
receptors for capturing and positioning one or more cargo elements within the cavity.

3. A quantum information processing element according to claim 2, comprising a vesicle
located within the cage and enclosing one or more cargo elements, wherein the
receptors extend through the vesicle to capture and position a cargo element within the
vesicle.

4. A quantum information processing element according to claim 3, comprising adaptors
disposed between the receptors and the cage and binding to the receptors.

5. A quantum information processing element according to claim 1, comprising a vesicle
located within the cage and enclosing the one or more cargo elements.

6. A quantum information processing element according to claim 1, comprising
molecular tethers for capturing and positioning one or more cargo elements within and
or outside the cavity.

7. A quantum information processing element according to claim 1, comprising direct
cage bonding for capturing and positioning one or more cargo elements within and or
outside the cavity.

8. A quantum information processing element according to claim 1, comprising
receptors, molecular tethers and direct cage bonding for capturing and positioning one
or more cargo elements within and or outside the cavity.

9. A quantum information processing element according to claim 1, comprising one or
more cargo elements forming a non-permeable cavity.

10. A quantum information processing element according to claim 3, comprising a
vesicle forming a non-permeable cavity.

11. A quantum information processing element according to claim 1, comprising a self-assembling cage that is electrically neutral and inhibits charge transfer between the cage and its enclosed cargo elements.

12. A quantum information processing element according to claim 1, comprising a self-assembling cage that reduces the tendency of a plurality of logical states in a coherent state to collapse into a decoherent state.

13. A quantum information processing element according to claim 1, comprising a non-qubit-only cage that inhibits non-quantum information processing cargo elements from interfering with qubit cargo element operation in other cages.

14. A quantum information processing element according to claim 3, comprising a self-assembling vesicle that is electrically neutral and inhibits charge transfer between the vesicle and its enclosed cargo elements.

15. A quantum information processing element according to claim 3, comprising a self-assembling insulative vesicle that reduces the tendency of a plurality of logical states in a coherent state to collapse into a decoherent state.

16. A quantum information processing element according to claim 4, comprising self-assembling receptors and adaptors that are electrically neutral and inhibit charge transfer between the vesicle and cage and their enclosed cargo elements.

19. A quantum information processing element according to claim 1, comprising a self-assembling framework of cages to structurally support one or more self-assembling QIP elements.

20. A quantum information processing element according to claim 1, comprising a self-assembling electrically neutral substrate of cages to structurally support one or more self-assembling QIP elements.

21. A quantum information processing element according to claim 1, comprising a self-assembling framework of cages to structurally order one or more self-aligning QIP elements.

22. A quantum information processing element according to claim 1, wherein a cage is empty and includes no cargo elements.

23. A quantum information processing element according to claim 1, wherein the one or more cargo elements is a single cargo element comprising a qubit programmable into a plurality of logical states.

24. A quantum information processing element according to claim 1, wherein the one or more cargo elements are a plurality of cargo elements.

25. A quantum information processing element according to claim 24, wherein the plurality of cargo elements are qubits programmable into a plurality of logical states.

26. A quantum information processing element according to claim 24, wherein at least some of the plurality of cargo elements are quantum information processing cargo elements

27. A quantum information processing element according to claim 24, wherein at least some of the plurality of cargo elements are non-quantum information processing cargo elements.

28. A quantum information processing element according to claim 1, wherein the cargo elements respond to stimuli internal and or external to the cage.

29. A quantum information processing element according to claim 3, wherein a vesicle and its contained cargo elements respond to stimuli internal and or external to the vesicle.

30. A quantum information processing element according to claim 24, wherein a subset of the non-quantum information processing cargo elements include one or more single task and or multitask in vivo and or in vitro agents.

36. A quantum information processing element according to claim 24, wherein a subset of the cargo elements include one or more liquids without dopants or with one or more dopants of any suitable type.

37. A quantum information processing element according to claim 24, wherein a subset of the cargo elements include a gas or vapor without dopants or with one or more dopants of any suitable type.

42. A quantum information processing element according to claim 1, wherein the qubit and the plurality of logical states of the qubit are defined by one or more properties or attributes.

45. A quantum information processing element according to claim 1, wherein the qubit includes one or more species of molecules.

47. A quantum information processing element according to claim 1, wherein the qubit is photon-based and the plurality of logical states of the photon-based qubit include a coherent logical state.

48. A quantum information processing element according to claim 1, wherein the plurality of logical states includes a coherent state.

49. A quantum information processing element according to claim 1, wherein the plurality of logical states includes a coherent state at room temperature.

51. A quantum information processing element according to claim 1, wherein the cage comprises self-assembling synthetic protein molecules.

52. A quantum information processing element according to claim 4, wherein receptors, adaptors, and vesicle comprise natural and or synthetic protein molecules.

53. A quantum information processing element according to claim 1, comprising a coating of one or more materials on part or the entirety of the cage.

54. A quantum information processing element according to claim 4, comprising a coating of one or more materials on a portion or an entirety of the receptors, adaptors, and vesicle.

55. A quantum information processing element according to claim 1, wherein the cage is substantially greater than one nanometer in diameter.

56. A quantum information processing element according to claim 1, wherein the cage is at least about 50 nanometers in diameter.

57. A quantum information processing element according to claim 1, wherein the cage is at least about 100 nanometers in diameter.

58. A quantum information processing element according to claim 1, wherein the cage is symmetric with respect to a plane.

59. A quantum information processing element according to claim 1, wherein the cage has icosahedral geometry.

60. A quantum information processing element according to claim 1, wherein qubits are linearly positioned at vertices along a single plane using circulant ordering.

61. A quantum information processing element according to claim 1, wherein multiple quantum information processing elements are physically linked together.

62. A quantum information processing element according to claim 1, wherein multiple self-assembling QIP elements are functionally linked together, locally and or at a distance.

63. A quantum information processing element according to claim 1, wherein the quantum information processing element forms a hybrid system upon its physical and or functional integration with non-invention elements in vitro and or in vivo.

64. A method for forming a quantum information processing element comprising forming from self-assembling protein molecules a cage defining a cavity, and locating one or more cargo elements within the cavity, wherein at least one of the cargo elements comprises a qubit programmable into a plurality of logical states.

65. A quantum information processing element according to claim 1, wherein the quantum information processing element comprises,
        a functionalized cage for attaching one or more elements external to the cage.

The element and method mapped out in the base claims of the instant

application (claims 1 and 64), describe an adenovirus. Figure 1 on page 26 of Stewart

et al. diagrams the adenovirus. The adenovirus is a cage of self-assembling proteins

defining a cavity, wherein at least one of the cargo elements comprises a qubit

programmable into a plurality of logical states. Since a virus holds nucleic acids, and

each atom and/or molecule of nucleic acid can be considered a qubit based on its

electron spin (i.e. every molecule, no matter how large has a wave function), the

adenovirus fits the description of the QIP element stated in the base claim.

It is evident from Figure 1 of Stewart et al. that the schematic has receptors

useful for positioning the contents of the virus. The interior of the virus forms a vesicle

through which the receptors extend. "Adaptors" also exist in the diagram. This vesicle

is located within the protein "cage" and encloses one or more cargo elements. The

receptors are interpreted to act as tethers for capturing and infecting biological objects

outside the virus. In addition, the contents of the virus have the capability of directly

bonding to the interior of the protein cage. The QIP element as shown in Figure 1 is

non-permeable and has a non-permeable vesicle to shield outside molecules. The QIP

element (or in this case virus) is electrostatically neutral at a single value of pH; when

solution conditions are adjusted to this value of pH, charge transfer is inhibited. At the

isoelectric pH, charge transfer between viruses, receptors, and adaptors is inhibited.

In the case of an empty virus (no cargo elements), the cage comprises a non-

qubit only cage. Viruses together as shown in Figure 1 of Stewart et al. comprise a self-

assembling framework of cages to structurally support one or more self assembling QIP

elements. At the isoelectric pH, these frameworks of cages are electrostatically neutral.

The framework of cages can align the structural elements within each virus.

Viruses respond to stimuli external to the virus itself (i.e. the method in which the

adenovirus is spread). The nucleic acids inside the virus are considered multitask in

vitro agents. It is inherent that an atom on at least one molecule of the nucleic acid has

an unpaired electron used to define the qubit by electron spin polarization. The nucleic

acid is also a plurality of QIP elements physically linked together. The virus encloses a

plurality of different molecules and is self-assembled. In vivo viruses are in aqueous

solution, so they are enclosed and coated with water molecules. Figure 3 of Stewart et

al. illustrates that adenoviruses are greater than 100 nanometers in diameter.

Figure 3 of Stewart et al. illustrates that the adenovirus has icosahedral

symmetry, and it is possible to position qubits symmetrically within the icosahedron.

The icosahedral symmetry is symmetric with respect to several planes.

It is inherent, that when investigated on an atomic level, the nucleic acids atoms

form coherent states that collapse into a decoherent state in the classical limit of the

entire virus.

Claims 1, 3, 17, 18, 24, 34, 35, and 38 are rejected under 35 U.S.C. 102(b) as

being anticipated by Lee et al. [Science, May 3, 2002; volume 296, pages 892-895] in

light of Overman et al. [Biophysical Journal, volume 66, page A394, 1994, poster

abstract].

Claims 1, 3, 17, 18, 24, 34, 35, and 38 state:

1. A quantum information processing element comprising a cage defining a cavity
formed from a plurality of self-assembling protein molecules, and one or more cargo
elements located within the cavity, wherein at least one of the cargo elements
comprises a qubit programmable into a plurality of logical states.

3. A quantum information processing element according to claim 2, comprising a vesicle
located within the cage and enclosing one or more cargo elements, wherein the
receptors extend through the vesicle to capture and position a cargo element within the
vesicle.

17. A quantum information processing element according to claim 1, comprising a self-
assembling cage that reduces contaminant background radiation to cargo carried within
the cage.

18. A quantum information processing element according to claim 3, comprising a self-
assembling vesicle that reduces contaminant background radiation to cargo carried
within the vesicle.

24. A quantum information processing element according to claim 1, wherein the one or
more cargo elements are a plurality of cargo elements.

34. A quantum information processing element according to claim 24, wherein a subset
of qubit and non-quantum information processing cargo elements include one or more
quantum dots.

35. A quantum information processing element according to claim 24, wherein a subset
of the cargo elements include one or more photonic dots.

38. A quantum information processing element according to claim 1, wherein one or more qubit cargo elements are programmed by one or more pulses of electromagnetic radiation.

In the article, "Ordering Quantum dots using genetically engineered viruses," Lee et al. describes genetically engineered crystals which incorporate zinc sulfide quantum dots. For example, column 3,of page 892, lines 4-9 state, "Here we report our first effort to direct multi-length scale ordering of quantum dot (QD) hybrid self-supporting biocomposite structures using genetically engineered M13 bacteriophage." A photonic dot is the microcavity that holds the quantum dots.

The last sentence of the abstract shows how the quantum dots are programmable by use of a magnetic field, "In addition, suspensions were prepared in which the lyotropic liquid crystalline phase behavior of the hybrid material was controlled by solvent concentration and by the use of a magnetic field." Thus, the virus affects the magnetic radiation experienced by the quantum dots.

It is inherent that the bacteriophage M13 virus is self assembling, as described in the abstract of Overman et al., entitled, "Raman spectroscopy of filamentous bacteriophage Ff (fd, f1, M13): Assignment and structural interpretation of coat protein aromatics," presented is a conference section entitled, "Folding and self-assembly IV: Spectroscopic and Methodological Studies," in which structural information of self assembled bacteriophage is obtained by Raman spectroscopy.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of

the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g)

prior art under 35 U.S.C. 103(a).

Claims 1 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Zampighi et al. [Journal of Structural Biology, volume 119, 1997, pages 347-359] in view

of Greene et al. [Traffic, 2000, volume 1, pages 69-75].

Claims 1 and 50 state:

1. A quantum information processing element comprising a cage defining a cavity
formed from a plurality of self-assembling protein molecules, and one or more cargo
elements located within the cavity, wherein at least one of the cargo elements
comprises a qubit programmable into a plurality of logical states.

50. A quantum information processing element according to claim 1, wherein the self-
assembling protein molecule is a clathrin molecule.

The article of Zampighi et al. entitled, "Polyhedral protein cages encase synaptic vesicles and participate in their attachment to the active zone," states in the fourth and fifth sentences of the abstract, "Type II synaptic vesicles were composed of a ~45-nm-diameter lipid bilayer sphere encased in a cage.... The cage was composed of open-faced pentamers 20-22 nm/side arranged as a regular polyhedron." The abstract continues, "Clathrin coated vesicles and pits... were also present in pre- and postsynaptic sides." Zampighi states in page 348 of the article, column 1, line 12 from the bottom, "Another type of vesicle, called type II, was composed of a lipid bilayer sphere encased in a polyhedral cage." The atoms on this lipid bilayer may act as a plurality of qubits. An example of an enclosed qubit is given in the specification on page 2 as an atom or molecule enclosed by a C_{60} fullerene molecule; in this case the plurality of qubits lie along the lipid bilayer enclosed by the protein cage.

However, Zampighi does not teach self-assembling clathrin molecules.

As the title of he article of Greene et al. suggests, "Complete reconstruction of clathrin basket formation with recombinant protein fragments: adaptor control and clathrin self-assembly," clathrin molecules are used in self-assembly to form cages.

It would have been obvious for someone or ordinary skill in the art at the time of the instant invention to combine the teachings of Zampighi et al. and Greene et al. to result in the instantly claimed invention because while Zampighi et al teaches structure of the lipids in the protein cages, Greene et al. teaches analogous art for self assembling clathrins.

Conclusion

No claim is allowed.

Papers related to this application may be submitted to Technical Center 1600 by facsimile transmission. Papers should be faxed to Technical Center 1600 via the central PTO Fax Center. The faxing of such pages must conform with the notices published in the Official Gazette, 1096 OG 30 (November 15, 1988), 1156 OG 61 (November 16, 1993), and 1157 OG 94 (December 28, 1993)(See 37 CFR § 1.6(d)). The Central PTO Fax Center Number is (571) 273-8300.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russell Negin, Ph.D., whose telephone number is (571) 272-1083. The examiner can normally be reached on Monday-Friday from 7am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's Supervisor, Andrew Wang, Supervisory Patent Examiner, can be reached at (571) 272-0811.

Any inquiry of a general nature or relating to the status of this application should be directed to Legal Instrument Examiner, Tina Plunkett, whose telephone number is (571) 272-0549.

Information regarding the status of the application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information on the PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

-RSN 5/25/2006

JOHN S. BRUSCA, PH.D
PRIMARY EXAMINER